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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Hideyoshi Horimai

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EXAMINER

CHANG, AUDREY Y

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/556,651	<b>Applicant(s)</b> HORIMAI, HIDEYOSHI	
	<b>Examiner</b> Audrey Y. Chang	<b>Art Unit</b> 2872	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-28 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☒ Claim(s) 29, 30 are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date ____. | 6) <input type="checkbox"/> Other: ____.  |

## DETAILED ACTION

### *Claim Objections*

1. **Claims 29 and 30 are** objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claim cannot dependent from another multiple dependent claims. See MPEP § 608.01(n). Accordingly, the claims 29 and 30 have not been further treated on the merits.

2. **Claims 1, 4-6, 7, and 10-28 are objected to because of the following informalities:**

(1). The phrase "that interference is not easily generated between reference light in said information recording layer" as recited in claims 1, 7, 17, and 22 is confusing since it is not clear by standard is the condition of "not easily generated" is determined.

(2). The phrase "reproduction light" recited in claims 17-19, 22-23, and 25-26 is confusing since it is not clear if the "reproduction light" is referred to the light used *to reconstruct* the holographic image or the holographic image light generated after the reconstruction of the hologram. Please specify.

(3). The phrase "the spatial light modulator has the cyclic pattern" as recited in claims 6, and 21 is confusing since it is not clear the cyclic pattern is referred to what? Or what is formed of cyclic pattern?

(4). Claim 10 is confusing since it is not clear what type of multiplexing is referred here. Since radial patterns of the reference light are generated simultaneously, multiplexedly recorded holograms can be recorded without rotating the plurality of radial patterns. It is therefore not clear the rotation of the patterns is to achieve what type of the multiplexing recordation.

Appropriate correction is required.

### *Claim Rejections - 35 USC § 112*

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

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4. **Claims 17-28 are rejected under 35 U.S.C. 112, first paragraph**, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The specification and the claims fail to teach how could the reproducing light is able to have area on the entrance pupil of the object lens. Since the reproduce light, if referred to the holographic image light, then it cannot be incident on the object lens. Certain critical condition or arrangement is required to achieve such.

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. **Claims 1-6, 7-16, 17-21 and 22-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Orlov et al (PN. 6,108,110) in view of the patent issued to Heanue et al (PN. 5,940,514).**

**Orlov et al** teaches a *holographic storage and retrieval system* that is comprised of a *first* spatial light modulator (12, Figures 1-2) for spatial modulating a light from a source (16) and generating an *information* light or *signal light* (18), and a *reference generator* (28) for spatial modulating a light from a source (16) and generating a *reference* light (32). The signal or information light (18) and the reference light (32) are directed to an *object lens* (38) with the area of the reference light, at the entrance of the object lens, surrounds the area of the signal or information light. The reference light and the information

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or signal light intersects and interferes with each other at a location of a holographic disc or *information recording layer* (40) to record the interference pattern as a hologram, (please see column 4, line 19 to column 5, line 10).

It is implicitly true that the spatial light modulator (12) for modulating the information or signal light implicitly has a plurality pixels. This reference has met all the limitations of the claims with the exception that it does not teach explicitly that the reference generator (28), disposed at the periphery of the first spatial light modulator (12), comprises also a spatial light modulator. Orlov et al teaches that the reference generator (28) may include diffuser, lenses, phase plate or optical system (please see column 4, line 43, 49-51). **Heanue** et al in the same field of endeavor teaches that a diffuser or phase plate may be provided by *spatial light modulator* (PSLM, please see column 4, line 18, column 9, lines 1-10). It would then have been obvious to one skilled in the art to use spatial light modulator as an alternative means to provide phase modulation or diffusing function as the phase plate or diffuser (i.e. the reference generator) for the benefit of using known means to provide the phase modulation and in addition to use spatial light modulator that allows the change and control of the phase modulation.

This reference also does not teach explicitly "that interference is not easily generated between the reference light in said information recording layer". However it is not clear what does this phrase really means. But since Orlov et al teaches the same arrangement as the instant application, the holographic storage and retrieval system of Orlov et al must also satisfy "that interference is not easily generated between the reference light in said information recording layer" the same way as the instant application.

With regard to claim 4-6, Orlov et al teaches that the first spatial light modulator (12, Figures 1-2) and the reference generator (28) are disposed at the same plane (22). **Heanue** et al teaches that the reference generator (such as phase plate or diffuser) may also be provided by spatial light modulator. This means one skilled in the art would have been motivated to make the reference generator and the first spatial light modulator with a single spatial light modulator with the peripheral regions provide the phase

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modulator or phase plate to generate the reference light and the central regions provide information modulation to provide the information or signal light for the benefit of using a single element to achieve both functions. With regard to claim 5, it is implicitly true that the spatial light modulator has a plurality of pixels that are capable of modulate the intensity, phases of the light. With regard to claim 6, it is not clear what is considered to be the "cyclic pattern". This really cannot be examined with details. The reference light is deflected so that the traveling direction is different from the optical axis the same way as the instant application.

With regard to claims 7-10, the method for recording the hologram is implicitly included in the disclosure of the recording system and is rejected with respect to Orlov et al in combination with Heanue et al for the same reasons as stated for claims 1-3 above. Orlov et al teaches that the reference generator (28) may include various optical elements that are adapted to provide shift speckle multiplexing, (please see column 4, lines 45-46). This means the reference light is radially generated that includes certain radial patterns. **With regard to claim 9**, the radially distributed reference lights have a virtual center coincide with the center of the information or signal light. **With regard to claim 10**, Orlov et al teaches that the plurality of the reference lights generated by the reference generator can be adapted to provide shift speckle multiplexing. The shift speckle multiplexing involves using different phase-modulated reference light to record multiple holograms at different or overlapped recording locations. Although this reference does not teach explicitly about changing the virtual center angle between the plurality of the radial patterns, but if this changing of angles are referred to angular multiplexing scheme, then one skilled in the art must understand that the angular multiplexing scheme is well known in the art for the benefit of providing multiple recording.

With regard to claims 11-13, the method for recording the hologram is implicitly included in the disclosure of the recording system and is rejected with respect to Orlov et al in combination with Heanue et al for the same reasons as stated for claims 1-3 above. Although these references do not teach

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explicitly that the area of the reference light is asymmetric with respect to the center of the reference light. These references also do not teach that the area of the information light is wider than the reference light. Orlov et al does teaches that the reference light generator can include various optical elements, It is therefore possible to provide reference lights with various patterns for the benefit of providing different types of hologram recording.

With regard to claims 14-16, Orlov et al teaches that the first spatial light modulator (12, Figures 1-2) and the reference generator (28) are disposed at the same plane (22). Heanue et al teaches that the reference generator (such as phase plate or diffuser) may also be provided by spatial light modulator. This means one skilled in the art would have been motivated to make the reference generator and the first spatial light modulator with a single spatial light modulator with the peripheral regions provide the phase modulator or phase plate to generate the reference light and the central regions provide information modulation to provide the information or signal light for the benefit of using a single element to achieve both functions. With regard to claim 15, it is implicitly true that the spatial light modulator has a plurality of pixels that are capable of modulate the intensity, phases of the light. With regard to claim 16, the reference light is deflected so that the traveling direction is different from the optical axis the same way as the instant application.

With regard to claims 17-19, **Orlov** et al teaches a *holographic storage and retrieval system* that is comprised of a *first* spatial light modulator (12, Figures 1-2) for spatial modulating a light from a source (16) and generating an *information* light or *signal light* (18), and a *reference generator* (28) for spatial modulating a light from a source (16) and generating a *reference* light (32). The signal or information light (18) and the reference light (32) are directed to an *object lens* (38) with the area of the reference light, at the entrance pupil of the object lens, surrounds the area of the signal or information light. The reference light and the information or signal light intersects and interferes with each other at a location of a holographic disc or *information recording* layer (40) to record the interference pattern as a

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hologram, (please see column 4, line 19 to column 5, line 10). Orlov et al teaches that in the retrieval process, the reference light (32) incidents on the information recording layer to interfere with the recorded hologram to generate the *reconstructed signal beam* (50) serves as the *reproducing* light. Since the *reconstructed* signal or information light is the same as the signal or information light, this means the area of the reference light on the object lens surrounds the area of the signal or information light on the object lens.

It is implicitly true that the spatial light modulator (12) for modulating the information or signal light implicitly has a plurality pixels. This reference has met all the limitations of the claims with the exception that it does not teach explicitly that the reference generator (28), disposed at the periphery of the first spatial light modulator (12), comprises a spatial light modulator. Orlov et al teaches that the reference generator (28) may include diffuser, lenses, phase plate or optical system (please see column 4, line 43, 49-51). **Heanue** et al in the same field of endeavor teaches that a diffuser or phase plate may be provided by *spatial light modulator* (PSLM, please see column 4, line 18, column 9, lines 1-10). It would then have been obvious to one skilled in the art to use spatial light modulator as an alternative means to provide phase modulation or diffusing function as the phase plate or diffuser (i.e. the reference generator) for the benefit of using known means to provide the phase modulation and in addition to use spatial light modulator that allows the change and control of the phase modulation.

This reference also does not teach explicitly "that interference is not easily generated between the reference light in said information recording layer". However it is not clear what does this phrase really means. But since Orlov et al teaches the same arrangement as the instant application, the holographic storage and retrieval system of Orlov et al must also satisfy "that interference is not easily generated between the reference light in said information recording layer" the same way as the instant application.

With regard to claims 20-21, it is implicitly true that the spatial light modulator comprise a plurality of pixels. With regard to claim 21, it is not clear what is considered to be the "cyclic pattern".



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This really cannot be examined with details. The reference light is deflected so that the traveling direction is different from the optical axis the same way as the instant application.

With regard to claims 22-26, the method for generating reconstructed signal light is implicitly included in the disclosures of the retrieval arrangement of Orlov et al in combination with the teachings of Heanue et al as stated in claims 17-19 above. With regard to claim 24, the center of the area of the reference light and the virtual center of the plurality of reference light are optical axes of the optical storage and retrieval system. With regard to claim 25, this reference does not teach explicitly that the area of the reference light on the entrance pupil of the object lens is asymmetric to the center of the area. Orlov et al teaches that the reference light generator may include variety of optical elements. It is possible and would be obvious to one skilled in the art to make the reference light has asymmetric pattern for the benefit of allowing different types of the holograms been recorded.

With regard to claim 27, the reference generator taught by Orlov et al in combination with the teachings of Heanue et al teaches that the intensity and phase of the reference light are spatially modulated.

With regard to claim 28, the traveling direction of the reference light deflected in a direction other than the optical axis direction the same way as the instant application.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Audrey Y. Chang whose telephone number is 571-272-2309. The examiner can normally be reached on Monday-Friday (9:00-4:30), alternative Mondays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephone B. Allen can be reached on 571-272-2434. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

***Audrey Y. Chang, Ph.D.***  
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